



Full wwPDB X-ray Structure Validation Report ⓘ

Aug 27, 2023 – 12:37 PM EDT

PDB ID : 3H55
Title : Crystal Structure of human alpha-N-acetylgalactosaminidase, Complex with Galactose
Authors : Clark, N.E.; Garman, S.C.
Deposited on : 2009-04-21
Resolution : 1.91 Å(reported)

This is a Full wwPDB X-ray Structure Validation Report for a publicly released PDB entry.

We welcome your comments at validation@mail.wwpdb.org

A user guide is available at

<https://www.wwpdb.org/validation/2017/XrayValidationReportHelp>

with specific help available everywhere you see the ⓘ symbol.

The types of validation reports are described at

<http://www.wwpdb.org/validation/2017/FAQs#types>.

The following versions of software and data (see [references ⓘ](#)) were used in the production of this report:

MolProbity : 4.02b-467
Mogul : 1.8.5 (274361), CSD as541be (2020)
Xtriage (Phenix) : 1.13
EDS : 2.35
Percentile statistics : 20191225.v01 (using entries in the PDB archive December 25th 2019)
Refmac : 5.8.0158
CCP4 : 7.0.044 (Gargrove)
Ideal geometry (proteins) : Engh & Huber (2001)
Ideal geometry (DNA, RNA) : Parkinson et al. (1996)
Validation Pipeline (wwPDB-VP) : 2.35

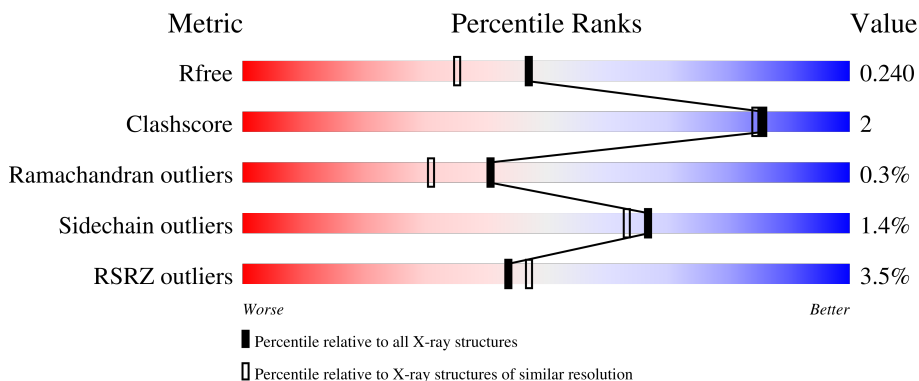
1 Overall quality at a glance i

The following experimental techniques were used to determine the structure:

X-RAY DIFFRACTION

The reported resolution of this entry is 1.91 Å.

Percentile scores (ranging between 0-100) for global validation metrics of the entry are shown in the following graphic. The table shows the number of entries on which the scores are based.



Metric	Whole archive (#Entries)	Similar resolution (#Entries, resolution range(Å))
R_{free}	130704	7937 (1.94-1.90)
Clashscore	141614	8644 (1.94-1.90)
Ramachandran outliers	138981	8530 (1.94-1.90)
Sidechain outliers	138945	8530 (1.94-1.90)
RSRZ outliers	127900	7793 (1.94-1.90)

The table below summarises the geometric issues observed across the polymeric chains and their fit to the electron density. The red, orange, yellow and green segments of the lower bar indicate the fraction of residues that contain outliers for ≥ 3 , 2, 1 and 0 types of geometric quality criteria respectively. A grey segment represents the fraction of residues that are not modelled. The numeric value for each fraction is indicated below the corresponding segment, with a dot representing fractions $\leq 5\%$. The upper red bar (where present) indicates the fraction of residues that have poor fit to the electron density. The numeric value is given above the bar.

Mol	Chain	Length	Quality of chain
1	A	400	<div style="display: flex; align-items: center;"> <div style="width: 3%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 92%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 5%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 2%; height: 10px; background-color: grey;"></div> </div> <p style="margin-left: 10px;">3% 92% 5% •</p>
1	B	400	<div style="display: flex; align-items: center;"> <div style="width: 4%; height: 10px; background-color: red; margin-right: 5px;"></div> <div style="width: 91%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 6%; height: 10px; background-color: yellow; margin-right: 5px;"></div> <div style="width: 2%; height: 10px; background-color: grey;"></div> </div> <p style="margin-left: 10px;">4% 91% 6% •</p>
2	C	4	<div style="display: flex; align-items: center;"> <div style="width: 25%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 75%; height: 10px; background-color: yellow; margin-right: 5px;"></div> </div> <p style="margin-left: 10px;">25% 75%</p>
3	D	5	<div style="display: flex; align-items: center;"> <div style="width: 40%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 60%; height: 10px; background-color: yellow; margin-right: 5px;"></div> </div> <p style="margin-left: 10px;">40% 60%</p>
3	F	5	<div style="display: flex; align-items: center;"> <div style="width: 20%; height: 10px; background-color: green; margin-right: 5px;"></div> <div style="width: 80%; height: 10px; background-color: yellow; margin-right: 5px;"></div> </div> <p style="margin-left: 10px;">20% 80%</p>

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Mol	Chain	Length	Quality of chain
4	E	3	 33% 67%

The following table lists non-polymeric compounds, carbohydrate monomers and non-standard residues in protein, DNA, RNA chains that are outliers for geometric or electron-density-fit criteria:

Mol	Type	Chain	Res	Chirality	Geometry	Clashes	Electron density
2	BMA	C	3	-	-	-	X
2	FUC	C	4	-	-	-	X
3	MAN	D	5	-	-	-	X
3	MAN	F	5	-	-	-	X
4	NAG	E	2	-	-	-	X
4	FUC	E	3	-	-	-	X

2 Entry composition [i](#)

There are 8 unique types of molecules in this entry. The entry contains 7399 atoms, of which 0 are hydrogens and 0 are deuteriums.

In the tables below, the ZeroOcc column contains the number of atoms modelled with zero occupancy, the AltConf column contains the number of residues with at least one atom in alternate conformation and the Trace column contains the number of residues modelled with at most 2 atoms.

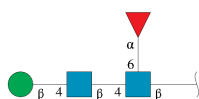
- Molecule 1 is a protein called Alpha-N-acetylgalactosaminidase.

Mol	Chain	Residues	Atoms					ZeroOcc	AltConf	Trace
			Total	C	N	O	S			
1	A	387	3103	1981	526	569	27	0	2	0
1	B	387	3089	1973	520	569	27	0	1	0

There are 14 discrepancies between the modelled and reference sequences:

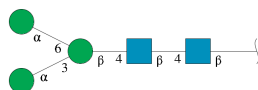
Chain	Residue	Modelled	Actual	Comment	Reference
A	201	GLN	ASN	engineered mutation	UNP P17050
A	412	HIS	-	expression tag	UNP P17050
A	413	HIS	-	expression tag	UNP P17050
A	414	HIS	-	expression tag	UNP P17050
A	415	HIS	-	expression tag	UNP P17050
A	416	HIS	-	expression tag	UNP P17050
A	417	HIS	-	expression tag	UNP P17050
B	201	GLN	ASN	engineered mutation	UNP P17050
B	412	HIS	-	expression tag	UNP P17050
B	413	HIS	-	expression tag	UNP P17050
B	414	HIS	-	expression tag	UNP P17050
B	415	HIS	-	expression tag	UNP P17050
B	416	HIS	-	expression tag	UNP P17050
B	417	HIS	-	expression tag	UNP P17050

- Molecule 2 is an oligosaccharide called beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose.



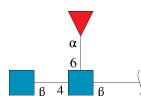
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
2	C	4	Total	C	N	O	0	0	0
			49	28	2	19			

- Molecule 3 is an oligosaccharide called alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose.



Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
3	D	5	Total	C	N	O	0	0	0
			61	34	2	25			
3	F	5	Total	C	N	O	0	0	0
			61	34	2	25			

- Molecule 4 is an oligosaccharide called 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose.



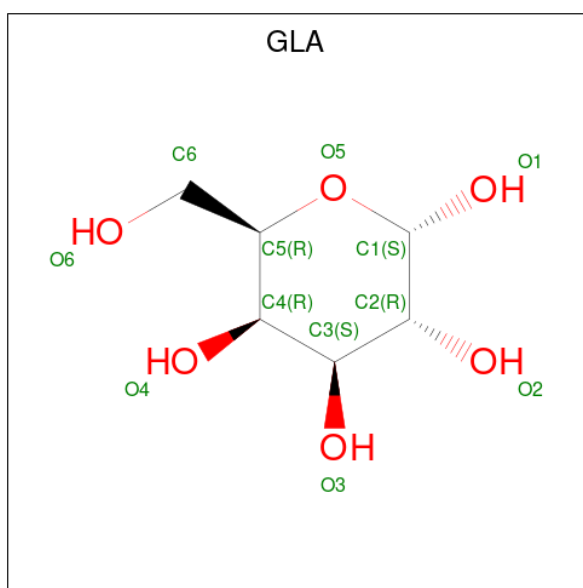
Mol	Chain	Residues	Atoms				ZeroOcc	AltConf	Trace
4	E	3	Total	C	N	O	0	0	0
			38	22	2	14			

- Molecule 5 is 2-acetamido-2-deoxy-beta-D-glucopyranose (three-letter code: NAG) (formula: C₈H₁₅NO₆).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf	
5	A	1	Total	C	N	O	0	0
			14	8	1	5		
5	B	1	Total	C	N	O	0	0
			14	8	1	5		

- Molecule 6 is alpha-D-galactopyranose (three-letter code: GLA) (formula: $C_6H_{12}O_6$).



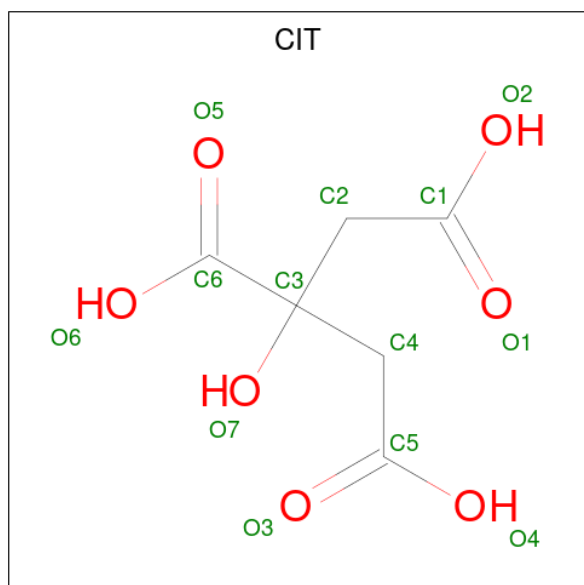
Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	A	1	Total	C	O	0	0
			12	6	6		
6	A	1	Total	C	O	0	0
			12	6	6		

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Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
6	B	1	Total	C	O	0	0
			12	6	6		
6	B	1	Total	C	O	0	0
			12	6	6		

- Molecule 7 is CITRIC ACID (three-letter code: CIT) (formula: C₆H₈O₇).



Mol	Chain	Residues	Atoms			ZeroOcc	AltConf
7	A	1	Total	C	O	0	0
			13	6	7		
7	B	1	Total	C	O	0	0
			13	6	7		

- Molecule 8 is water.

Mol	Chain	Residues	Atoms		ZeroOcc	AltConf
8	A	506	Total	O	0	0
			506	506		
8	B	390	Total	O	0	0
			390	390		

- Molecule 3: alpha-D-mannopyranose-(1-3)-[alpha-D-mannopyranose-(1-6)]beta-D-mannopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-2-acetamido-2-deoxy-beta-D-glucopyranose

Chain F:  20% 80%

MAG1
MAG2
BMA3
MAN4
MAN5

- Molecule 4: 2-acetamido-2-deoxy-beta-D-glucopyranose-(1-4)-[alpha-L-fucopyranose-(1-6)]2-acetamido-2-deoxy-beta-D-glucopyranose

Chain E:  33% 67%

MAG1
MAG2
FUC3

4 Data and refinement statistics

Property	Value	Source
Space group	C 1 2 1	Depositor
Cell constants a, b, c, α , β , γ	153.86Å 114.51Å 68.37Å 90.00° 96.17° 90.00°	Depositor
Resolution (Å)	28.57 – 1.91 28.57 – 1.91	Depositor EDS
% Data completeness (in resolution range)	95.3 (28.57-1.91) 95.3 (28.57-1.91)	Depositor EDS
R_{merge}	0.12	Depositor
R_{sym}	(Not available)	Depositor
$\langle I/\sigma(I) \rangle$ ¹	3.44 (at 1.91Å)	Xtrriage
Refinement program	REFMAC 5.5.0070	Depositor
R, R_{free}	0.196 , 0.236 0.198 , 0.240	Depositor DCC
R_{free} test set	4397 reflections (5.04%)	wwPDB-VP
Wilson B-factor (Å ²)	20.6	Xtrriage
Anisotropy	0.172	Xtrriage
Bulk solvent k_{sol} (e/Å ³), B_{sol} (Å ²)	0.37 , 47.8	EDS
L-test for twinning ²	$\langle L \rangle = 0.49$, $\langle L^2 \rangle = 0.32$	Xtrriage
Estimated twinning fraction	No twinning to report.	Xtrriage
F_o, F_c correlation	0.94	EDS
Total number of atoms	7399	wwPDB-VP
Average B, all atoms (Å ²)	24.0	wwPDB-VP

Xtrriage's analysis on translational NCS is as follows: *The largest off-origin peak in the Patterson function is 4.02% of the height of the origin peak. No significant pseudotranslation is detected.*

¹Intensities estimated from amplitudes.

²Theoretical values of $\langle |L| \rangle$, $\langle L^2 \rangle$ for acentric reflections are 0.5, 0.333 respectively for untwinned datasets, and 0.375, 0.2 for perfectly twinned datasets.

5 Model quality [i](#)

5.1 Standard geometry [i](#)

Bond lengths and bond angles in the following residue types are not validated in this section: FUC, NAG, GLA, CIT, BMA, MAN

The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 5$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Chain	Bond lengths		Bond angles	
		RMSZ	# Z >5	RMSZ	# Z >5
1	A	0.38	0/3188	0.54	0/4335
1	B	0.36	0/3174	0.51	0/4318
All	All	0.37	0/6362	0.53	0/8653

There are no bond length outliers.

There are no bond angle outliers.

There are no chirality outliers.

There are no planarity outliers.

5.2 Too-close contacts [i](#)

In the following table, the Non-H and H(model) columns list the number of non-hydrogen atoms and hydrogen atoms in the chain respectively. The H(added) column lists the number of hydrogen atoms added and optimized by MolProbity. The Clashes column lists the number of clashes within the asymmetric unit, whereas Symm-Clashes lists symmetry-related clashes.

Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
1	A	3103	0	3001	17	0
1	B	3089	0	2982	11	0
2	C	49	0	43	0	0
3	D	61	0	52	0	0
3	F	61	0	52	0	0
4	E	38	0	34	0	0
5	A	14	0	13	0	0
5	B	14	0	13	0	0
6	A	24	0	24	0	0
6	B	24	0	24	0	0
7	A	13	0	5	1	0

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Mol	Chain	Non-H	H(model)	H(added)	Clashes	Symm-Clashes
7	B	13	0	5	0	0
8	A	506	0	0	1	0
8	B	390	0	0	3	0
All	All	7399	0	6248	28	0

The all-atom clashscore is defined as the number of clashes found per 1000 atoms (including hydrogen atoms). The all-atom clashscore for this structure is 2.

All (28) close contacts within the same asymmetric unit are listed below, sorted by their clash magnitude.

Atom-1	Atom-2	Interatomic distance (Å)	Clash overlap (Å)
1:A:90[B]:ARG:CG	1:A:90[B]:ARG:HH11	1.63	1.09
1:A:90[B]:ARG:HH11	1:A:90[B]:ARG:HG2	1.35	0.91
1:A:90[B]:ARG:HH11	1:A:90[B]:ARG:HG3	1.37	0.90
1:A:90[B]:ARG:HG2	1:A:90[B]:ARG:NH1	2.05	0.65
1:A:90[B]:ARG:HG3	1:A:90[B]:ARG:NH1	2.08	0.65
1:B:229:LEU:HD11	1:B:272:LEU:HD13	1.78	0.65
1:A:90[A]:ARG:NH2	1:A:148:TRP:HE1	1.98	0.61
1:B:110:HIS:HE1	1:B:151:ASP:OD2	1.84	0.60
1:A:230:ASN:HB2	8:A:899:HOH:O	2.04	0.58
1:A:240:GLN:HG3	1:A:315[A]:ARG:HG2	1.89	0.55
1:A:90[B]:ARG:CG	1:A:90[B]:ARG:NH1	2.36	0.54
1:A:240:GLN:HG3	1:A:315[B]:ARG:HG3	1.90	0.53
1:B:237:ASP:OD1	1:B:315:ARG:NH2	2.41	0.53
1:A:347:MET:HB2	1:A:348:PRO:HD2	1.91	0.51
1:B:23:LEU:HD12	1:B:210:ASN:HB3	1.94	0.50
1:B:187:CYS:O	1:B:212:TRP:HA	2.13	0.49
1:B:122:MET:HG3	8:B:853:HOH:O	2.12	0.47
1:A:275:VAL:HG11	1:A:339:VAL:HG23	1.97	0.47
1:B:62:MET:HA	1:B:67:TRP:HB2	1.97	0.47
1:B:281:LEU:HD22	8:B:848:HOH:O	2.16	0.46
1:A:237:ASP:OD1	1:A:315[A]:ARG:NH2	2.49	0.45
1:A:114:LEU:O	7:A:1100:CIT:H22	2.18	0.43
1:A:109:VAL:HG13	1:A:114:LEU:HB2	1.99	0.43
1:B:347:MET:HB2	1:B:348:PRO:HD2	2.00	0.43
1:B:229:LEU:CD1	1:B:272:LEU:HD13	2.48	0.42
1:A:62:MET:HA	1:A:67:TRP:HB2	2.02	0.41
1:B:110:HIS:HD2	8:B:630:HOH:O	2.04	0.40
1:A:187:CYS:O	1:A:212:TRP:HA	2.22	0.40

There are no symmetry-related clashes.

5.3 Torsion angles [i](#)

5.3.1 Protein backbone [i](#)

In the following table, the Percentiles column shows the percent Ramachandran outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the backbone conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Favoured	Allowed	Outliers	Percentiles	
1	A	387/400 (97%)	375 (97%)	11 (3%)	1 (0%)	41	31
1	B	386/400 (96%)	375 (97%)	10 (3%)	1 (0%)	41	31
All	All	773/800 (97%)	750 (97%)	21 (3%)	2 (0%)	41	31

All (2) Ramachandran outliers are listed below:

Mol	Chain	Res	Type
1	A	252	ASP
1	B	252	ASP

5.3.2 Protein sidechains [i](#)

In the following table, the Percentiles column shows the percent sidechain outliers of the chain as a percentile score with respect to all X-ray entries followed by that with respect to entries of similar resolution.

The Analysed column shows the number of residues for which the sidechain conformation was analysed, and the total number of residues.

Mol	Chain	Analysed	Rotameric	Outliers	Percentiles	
1	A	335/346 (97%)	331 (99%)	4 (1%)	71	69
1	B	334/346 (96%)	329 (98%)	5 (2%)	65	61
All	All	669/692 (97%)	660 (99%)	9 (1%)	67	66

All (9) residues with a non-rotameric sidechain are listed below:

Mol	Chain	Res	Type
1	A	31	LEU
1	A	229	LEU
1	A	273	TRP
1	A	361	THR

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Mol	Chain	Res	Type
1	B	47	LYS
1	B	214	ASN
1	B	273	TRP
1	B	359	ASN
1	B	404	LYS

Sometimes sidechains can be flipped to improve hydrogen bonding and reduce clashes. All (6) such sidechains are listed below:

Mol	Chain	Res	Type
1	A	143	GLN
1	A	235	HIS
1	B	100	HIS
1	B	110	HIS
1	B	143	GLN
1	B	357	GLN

5.3.3 RNA [i](#)

There are no RNA molecules in this entry.

5.4 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

5.5 Carbohydrates [i](#)

17 monosaccharides are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
2	NAG	C	1	1,2	14,14,15	0.59	0	17,19,21	1.06	1 (5%)
2	NAG	C	2	2	14,14,15	0.58	0	17,19,21	0.96	1 (5%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
2	BMA	C	3	2	11,11,12	0.40	0	15,15,17	0.66	0
2	FUC	C	4	2	10,10,11	0.65	0	14,14,16	0.73	1 (7%)
3	NAG	D	1	3,1	14,14,15	0.55	0	17,19,21	0.72	0
3	NAG	D	2	3	14,14,15	0.53	0	17,19,21	0.63	0
3	BMA	D	3	3	11,11,12	0.35	0	15,15,17	1.19	1 (6%)
3	MAN	D	4	3	11,11,12	0.68	0	15,15,17	1.25	3 (20%)
3	MAN	D	5	3	11,11,12	0.63	0	15,15,17	0.99	1 (6%)
4	NAG	E	1	1,4	14,14,15	0.55	0	17,19,21	0.68	0
4	NAG	E	2	4	14,14,15	0.55	0	17,19,21	0.94	1 (5%)
4	FUC	E	3	4	10,10,11	0.62	0	14,14,16	0.81	1 (7%)
3	NAG	F	1	3,1	14,14,15	0.57	0	17,19,21	1.13	1 (5%)
3	NAG	F	2	3	14,14,15	0.56	0	17,19,21	0.74	0
3	BMA	F	3	3	11,11,12	0.43	0	15,15,17	0.96	1 (6%)
3	MAN	F	4	3	11,11,12	0.59	0	15,15,17	0.96	1 (6%)
3	MAN	F	5	3	11,11,12	0.54	0	15,15,17	1.22	1 (6%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
2	NAG	C	1	1,2	-	2/6/23/26	0/1/1/1
2	NAG	C	2	2	-	2/6/23/26	0/1/1/1
2	BMA	C	3	2	-	2/2/19/22	0/1/1/1
2	FUC	C	4	2	-	-	0/1/1/1
3	NAG	D	1	3,1	-	0/6/23/26	0/1/1/1
3	NAG	D	2	3	-	0/6/23/26	0/1/1/1
3	BMA	D	3	3	-	2/2/19/22	0/1/1/1
3	MAN	D	4	3	-	2/2/19/22	0/1/1/1
3	MAN	D	5	3	-	0/2/19/22	0/1/1/1
4	NAG	E	1	1,4	-	2/6/23/26	0/1/1/1
4	NAG	E	2	4	-	4/6/23/26	0/1/1/1
4	FUC	E	3	4	-	-	0/1/1/1
3	NAG	F	1	3,1	-	0/6/23/26	0/1/1/1
3	NAG	F	2	3	-	0/6/23/26	0/1/1/1
3	BMA	F	3	3	-	2/2/19/22	0/1/1/1
3	MAN	F	4	3	-	2/2/19/22	0/1/1/1

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Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
3	MAN	F	5	3	-	2/2/19/22	0/1/1/1

There are no bond length outliers.

All (14) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
3	F	5	MAN	C1-O5-C5	3.91	117.48	112.19
3	F	1	NAG	C1-O5-C5	3.69	117.19	112.19
3	D	4	MAN	C1-C2-C3	3.36	113.79	109.67
3	D	3	BMA	O5-C5-C6	3.09	112.05	107.20
2	C	2	NAG	C4-C3-C2	2.50	114.69	111.02
4	E	2	NAG	C4-C3-C2	2.40	114.54	111.02
3	D	4	MAN	O5-C5-C6	2.29	110.79	107.20
3	F	4	MAN	C1-O5-C5	2.22	115.20	112.19
3	F	3	BMA	C3-C4-C5	2.17	114.12	110.24
2	C	1	NAG	C4-C3-C2	2.12	114.12	111.02
4	E	3	FUC	C1-C2-C3	2.11	112.26	109.67
3	D	4	MAN	C2-C3-C4	2.07	114.48	110.89
2	C	4	FUC	C1-C2-C3	2.04	112.18	109.67
3	D	5	MAN	C1-C2-C3	2.00	112.13	109.67

There are no chirality outliers.

All (22) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
4	E	2	NAG	O7-C7-N2-C2
4	E	2	NAG	C8-C7-N2-C2
3	D	3	BMA	O5-C5-C6-O6
4	E	2	NAG	C4-C5-C6-O6
4	E	2	NAG	O5-C5-C6-O6
3	F	4	MAN	O5-C5-C6-O6
3	F	4	MAN	C4-C5-C6-O6
2	C	3	BMA	C4-C5-C6-O6
3	D	3	BMA	C4-C5-C6-O6
3	F	5	MAN	O5-C5-C6-O6
2	C	1	NAG	C4-C5-C6-O6
3	F	3	BMA	O5-C5-C6-O6
3	F	3	BMA	C4-C5-C6-O6
3	D	4	MAN	C4-C5-C6-O6
2	C	3	BMA	O5-C5-C6-O6
4	E	1	NAG	C4-C5-C6-O6

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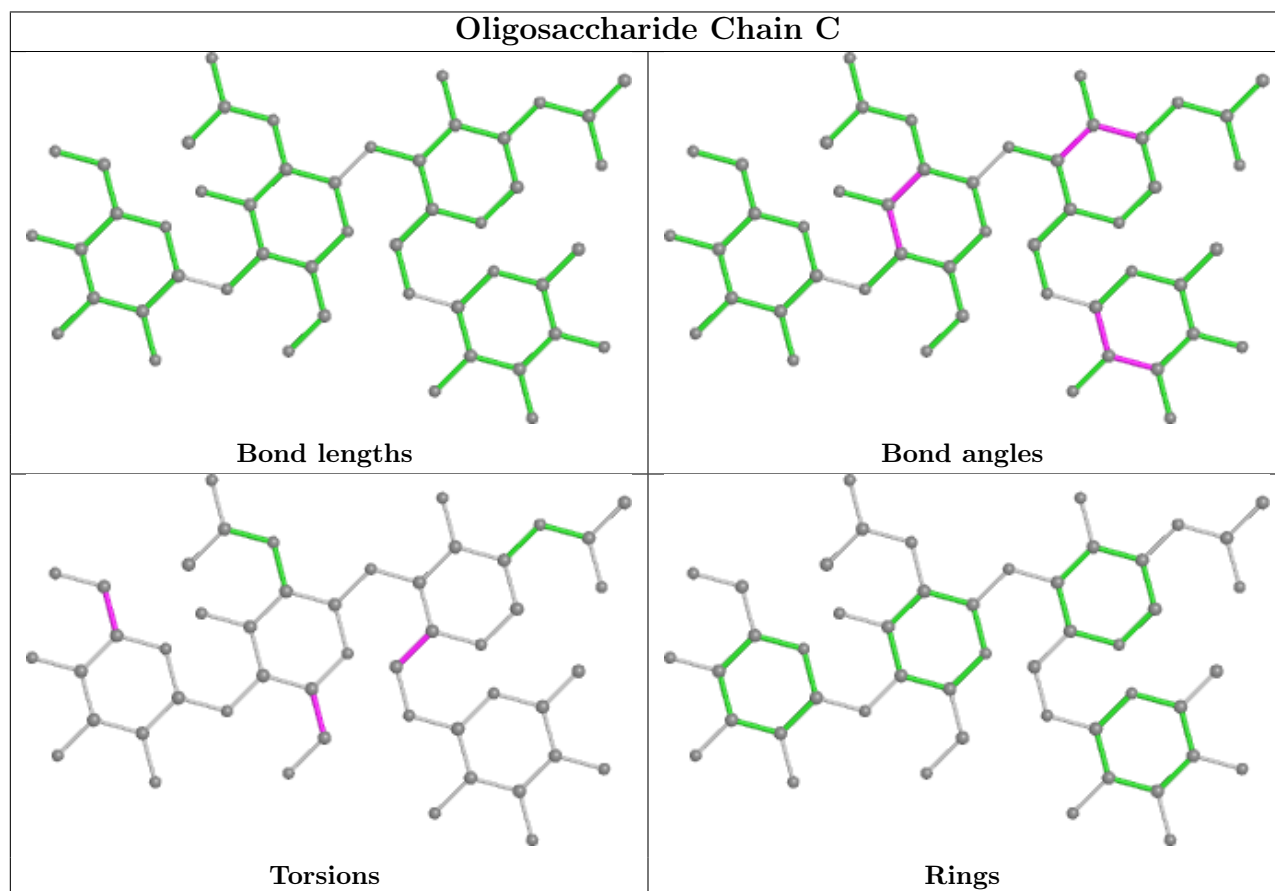
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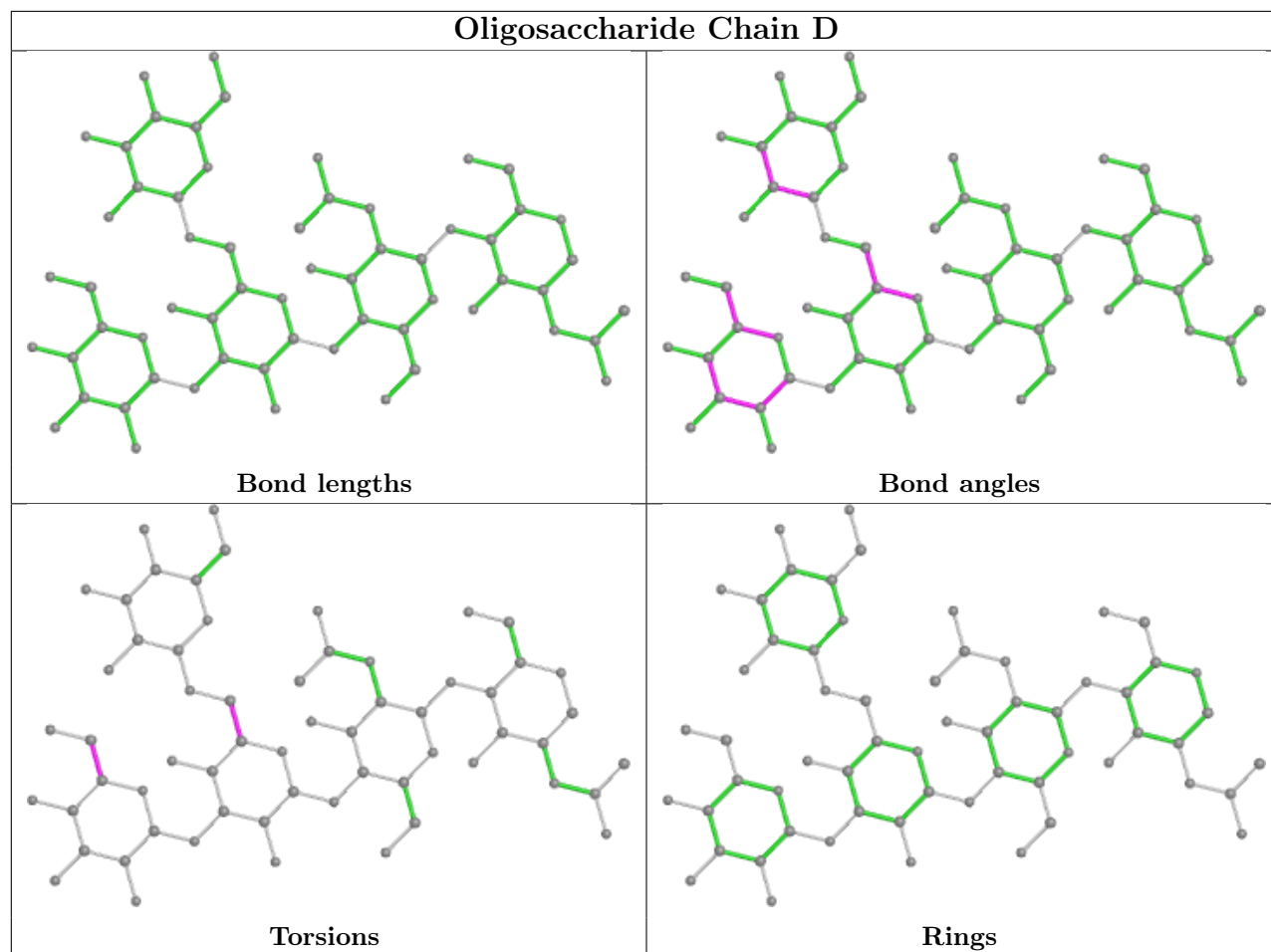
Mol	Chain	Res	Type	Atoms
3	D	4	MAN	O5-C5-C6-O6
2	C	1	NAG	O5-C5-C6-O6
4	E	1	NAG	O5-C5-C6-O6
2	C	2	NAG	C4-C5-C6-O6
2	C	2	NAG	O5-C5-C6-O6
3	F	5	MAN	C4-C5-C6-O6

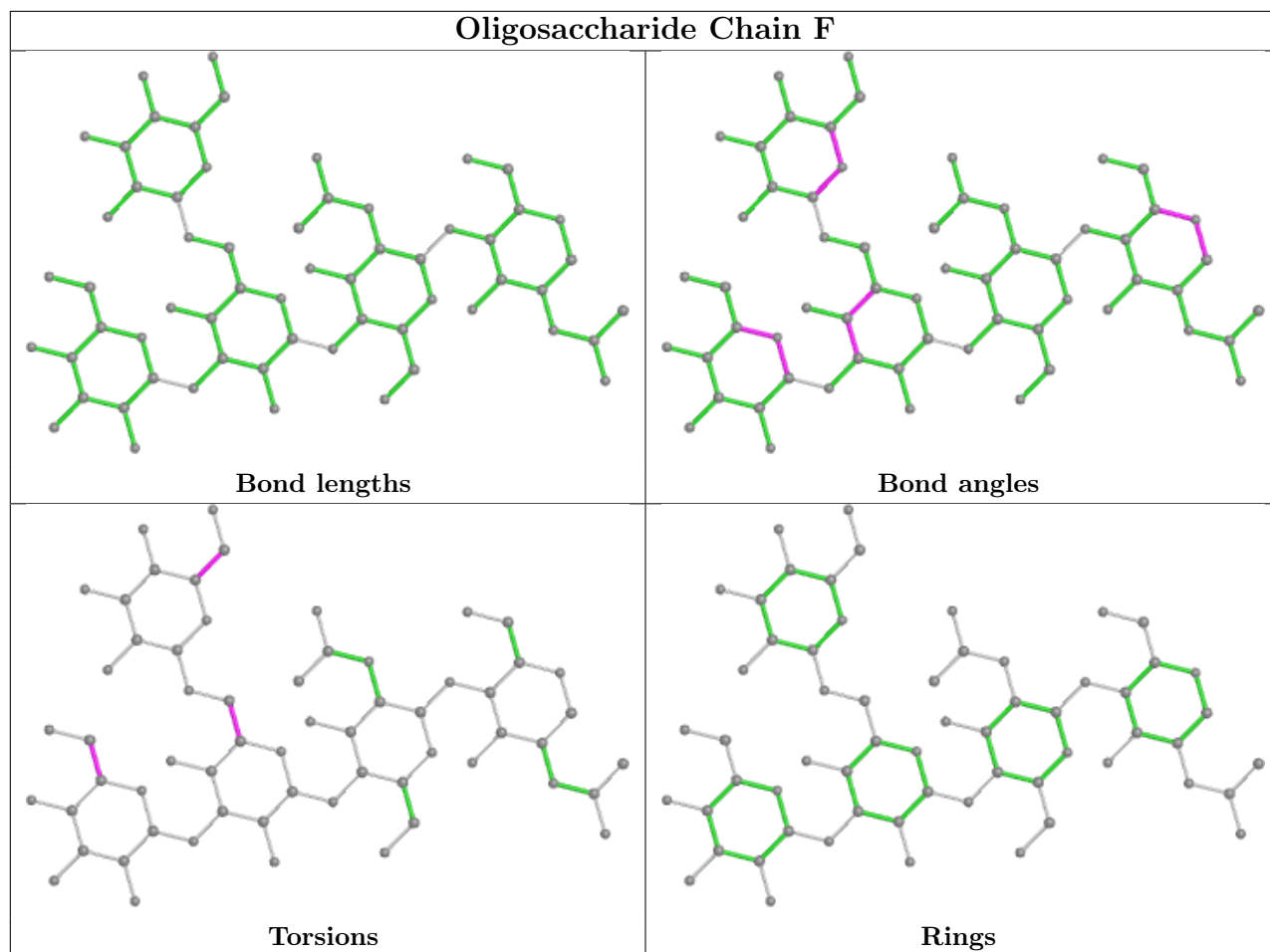
There are no ring outliers.

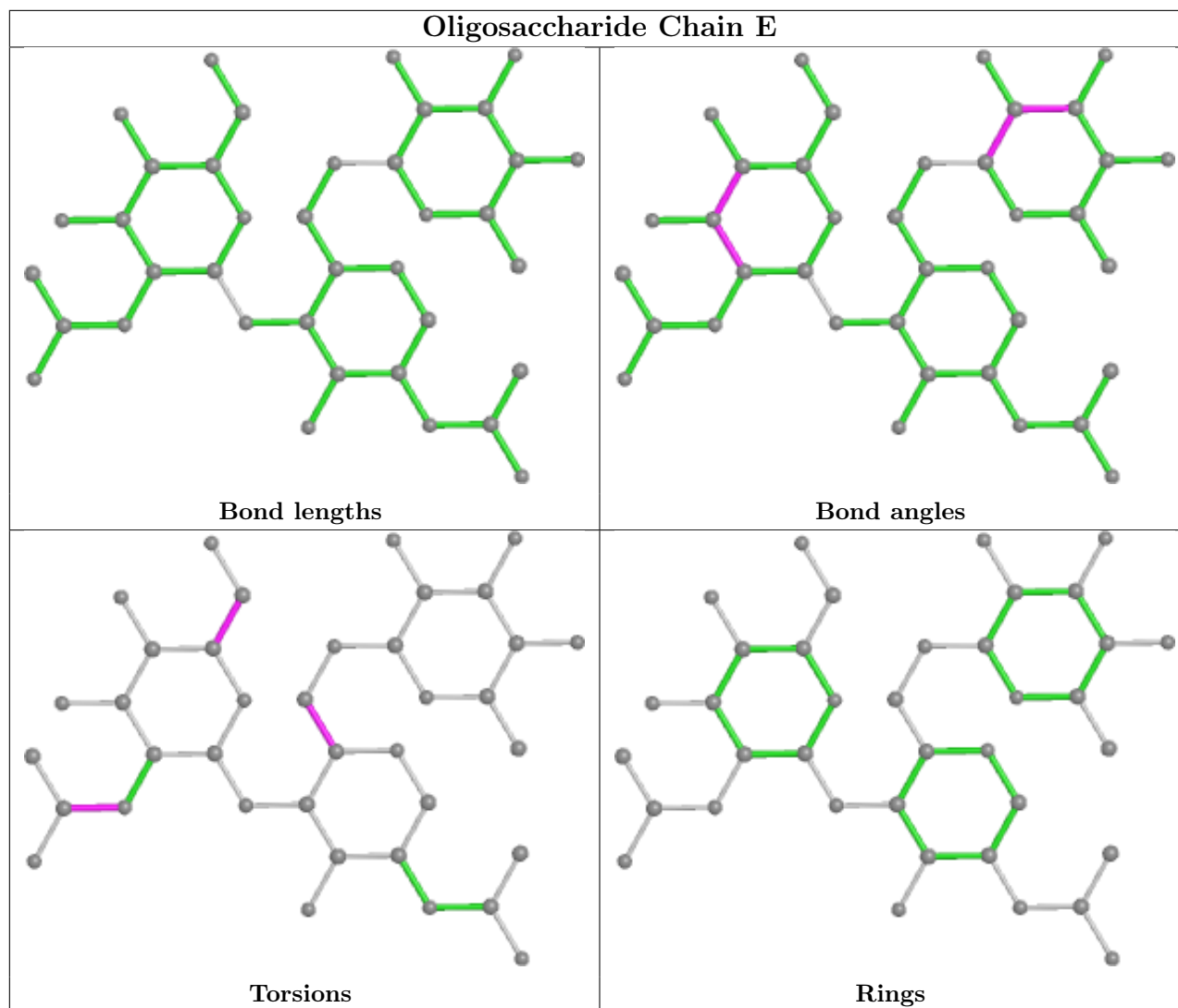
No monomer is involved in short contacts.

The following is a two-dimensional graphical depiction of Mogul quality analysis of bond lengths, bond angles, torsion angles, and ring geometry for oligosaccharide.









5.6 Ligand geometry [i](#)

8 ligands are modelled in this entry.

In the following table, the Counts columns list the number of bonds (or angles) for which Mogul statistics could be retrieved, the number of bonds (or angles) that are observed in the model and the number of bonds (or angles) that are defined in the Chemical Component Dictionary. The Link column lists molecule types, if any, to which the group is linked. The Z score for a bond length (or angle) is the number of standard deviations the observed value is removed from the expected value. A bond length (or angle) with $|Z| > 2$ is considered an outlier worth inspection. RMSZ is the root-mean-square of all Z scores of the bond lengths (or angles).

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	$\# Z > 2$	Counts	RMSZ	$\# Z > 2$
6	GLA	B	2500	-	12,12,12	0.55	0	17,17,17	0.79	0
5	NAG	A	885	1	14,14,15	0.51	0	17,19,21	0.76	0
7	CIT	A	1100	-	12,12,12	1.02	0	17,17,17	1.38	2 (11%)

Mol	Type	Chain	Res	Link	Bond lengths			Bond angles		
					Counts	RMSZ	# Z > 2	Counts	RMSZ	# Z > 2
7	CIT	B	2100	-	12,12,12	1.01	0	17,17,17	1.24	2 (11%)
6	GLA	A	1500	-	12,12,12	0.54	0	17,17,17	0.60	0
6	GLA	A	1000	-	12,12,12	0.51	0	17,17,17	1.00	2 (11%)
6	GLA	B	2000	-	12,12,12	0.55	0	17,17,17	0.86	1 (5%)
5	NAG	B	885	1	14,14,15	0.51	0	17,19,21	0.82	1 (5%)

In the following table, the Chirals column lists the number of chiral outliers, the number of chiral centers analysed, the number of these observed in the model and the number defined in the Chemical Component Dictionary. Similar counts are reported in the Torsion and Rings columns. '-' means no outliers of that kind were identified.

Mol	Type	Chain	Res	Link	Chirals	Torsions	Rings
6	GLA	B	2500	-	-	1/2/22/22	0/1/1/1
5	NAG	A	885	1	-	2/6/23/26	0/1/1/1
7	CIT	A	1100	-	-	4/16/16/16	-
7	CIT	B	2100	-	-	0/16/16/16	-
6	GLA	A	1500	-	-	1/2/22/22	0/1/1/1
6	GLA	A	1000	-	-	0/2/22/22	0/1/1/1
6	GLA	B	2000	-	-	0/2/22/22	0/1/1/1
5	NAG	B	885	1	-	0/6/23/26	0/1/1/1

There are no bond length outliers.

All (8) bond angle outliers are listed below:

Mol	Chain	Res	Type	Atoms	Z	Observed(°)	Ideal(°)
7	A	1100	CIT	O6-C6-C3	3.30	118.78	113.05
7	B	2100	CIT	O6-C6-C3	3.19	118.59	113.05
6	A	1000	GLA	C1-O5-C5	2.32	118.03	113.66
6	A	1000	GLA	O5-C5-C4	2.26	113.80	109.69
6	B	2000	GLA	C1-O5-C5	2.20	117.81	113.66
7	A	1100	CIT	O5-C6-C3	-2.13	119.23	122.25
7	B	2100	CIT	O5-C6-C3	-2.07	119.32	122.25
5	B	885	NAG	C1-O5-C5	2.02	114.93	112.19

There are no chirality outliers.

All (8) torsion outliers are listed below:

Mol	Chain	Res	Type	Atoms
5	A	885	NAG	C4-C5-C6-O6
5	A	885	NAG	O5-C5-C6-O6

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Mol	Chain	Res	Type	Atoms
6	A	1500	GLA	O5-C5-C6-O6
6	B	2500	GLA	O5-C5-C6-O6
7	A	1100	CIT	C2-C3-C6-O5
7	A	1100	CIT	C2-C3-C6-O6
7	A	1100	CIT	C4-C3-C6-O5
7	A	1100	CIT	C4-C3-C6-O6

There are no ring outliers.

1 monomer is involved in 1 short contact:

Mol	Chain	Res	Type	Clashes	Symm-Clashes
7	A	1100	CIT	1	0

5.7 Other polymers [i](#)

There are no such residues in this entry.

5.8 Polymer linkage issues [i](#)

There are no chain breaks in this entry.

6 Fit of model and data

6.1 Protein, DNA and RNA chains

In the following table, the column labelled ‘#RSRZ > 2’ contains the number (and percentage) of RSRZ outliers, followed by percent RSRZ outliers for the chain as percentile scores relative to all X-ray entries and entries of similar resolution. The OWAB column contains the minimum, median, 95th percentile and maximum values of the occupancy-weighted average B-factor per residue. The column labelled ‘Q < 0.9’ lists the number of (and percentage) of residues with an average occupancy less than 0.9.

Mol	Chain	Analysed	<RSRZ>	#RSRZ>2	OWAB(Å ²)	Q<0.9
1	A	387/400 (96%)	-0.09	11 (2%) 53 56	9, 17, 32, 57	1 (0%)
1	B	387/400 (96%)	0.11	16 (4%) 37 40	10, 21, 38, 59	0
All	All	774/800 (96%)	0.01	27 (3%) 44 47	9, 19, 36, 59	1 (0%)

All (27) RSRZ outliers are listed below:

Mol	Chain	Res	Type	RSRZ
1	A	361	THR	7.5
1	B	404	LYS	6.1
1	B	363	SER	4.5
1	B	42	CYS	4.1
1	A	321	LYS	3.4
1	A	42	CYS	2.9
1	B	321	LYS	2.7
1	B	43	ASP	2.7
1	A	118	ILE	2.6
1	A	77	ILE	2.6
1	A	31	LEU	2.6
1	A	404	LYS	2.6
1	B	87	ALA	2.5
1	B	88	SER	2.4
1	A	44	GLU	2.3
1	B	44	GLU	2.3
1	B	155	LEU	2.3
1	B	77	ILE	2.3
1	A	199	ARG	2.2
1	A	281	LEU	2.2
1	B	99	PRO	2.1
1	B	365	ILE	2.1
1	B	96	LYS	2.1
1	A	153	LEU	2.1

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Mol	Chain	Res	Type	RSRZ
1	B	153	LEU	2.1
1	B	118	ILE	2.1
1	B	31	LEU	2.1

6.2 Non-standard residues in protein, DNA, RNA chains [i](#)

There are no non-standard protein/DNA/RNA residues in this entry.

6.3 Carbohydrates [i](#)

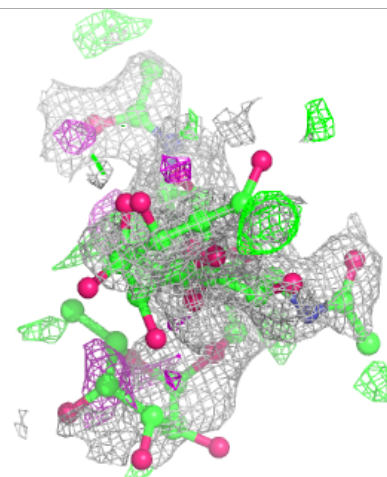
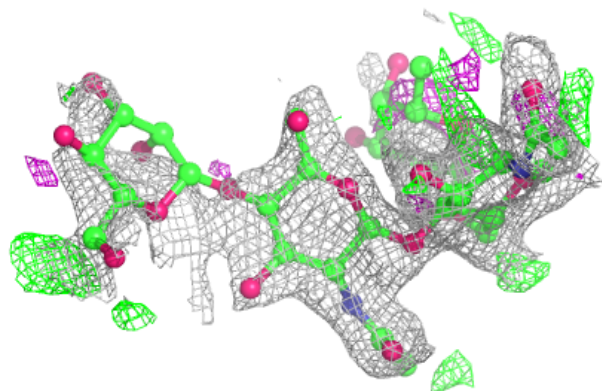
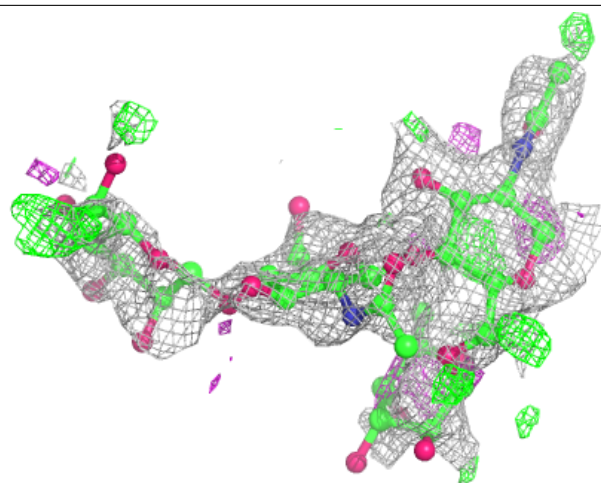
In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(Å ²)	Q<0.9
3	MAN	F	5	11/12	0.39	0.59	87,90,91,91	0
3	MAN	D	5	11/12	0.49	0.44	70,74,77,77	0
2	BMA	C	3	11/12	0.56	0.56	97,99,99,99	0
2	NAG	C	1	14/15	0.66	0.21	56,62,76,84	0
2	FUC	C	4	10/11	0.67	0.70	90,94,95,95	0
4	FUC	E	3	10/11	0.71	0.58	82,86,88,88	0
4	NAG	E	2	14/15	0.72	0.44	76,78,82,82	0
2	NAG	C	2	14/15	0.73	0.39	80,84,88,93	0
3	BMA	F	3	11/12	0.82	0.27	62,69,75,82	0
3	MAN	D	4	11/12	0.82	0.27	62,68,71,73	0
3	MAN	F	4	11/12	0.84	0.33	78,79,81,82	0
4	NAG	E	1	14/15	0.86	0.16	52,59,71,76	0
3	BMA	D	3	11/12	0.88	0.14	35,47,54,63	0
3	NAG	D	2	14/15	0.92	0.13	30,35,43,44	0
3	NAG	F	2	14/15	0.94	0.16	36,42,46,54	0
3	NAG	F	1	14/15	0.95	0.10	25,29,34,38	0
3	NAG	D	1	14/15	0.96	0.09	20,25,34,34	0

The following is a graphical depiction of the model fit to experimental electron density for oligosaccharide. Each fit is shown from different orientation to approximate a three-dimensional view.

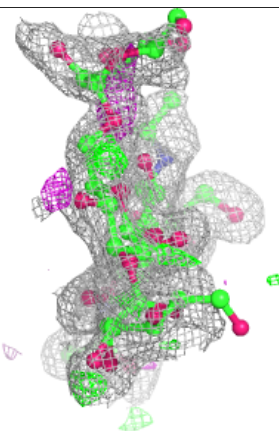
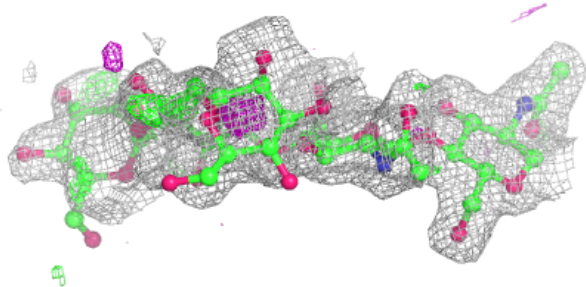
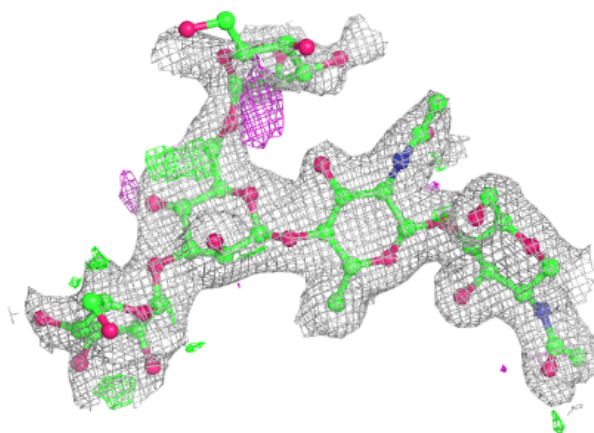
Electron density around Chain C:

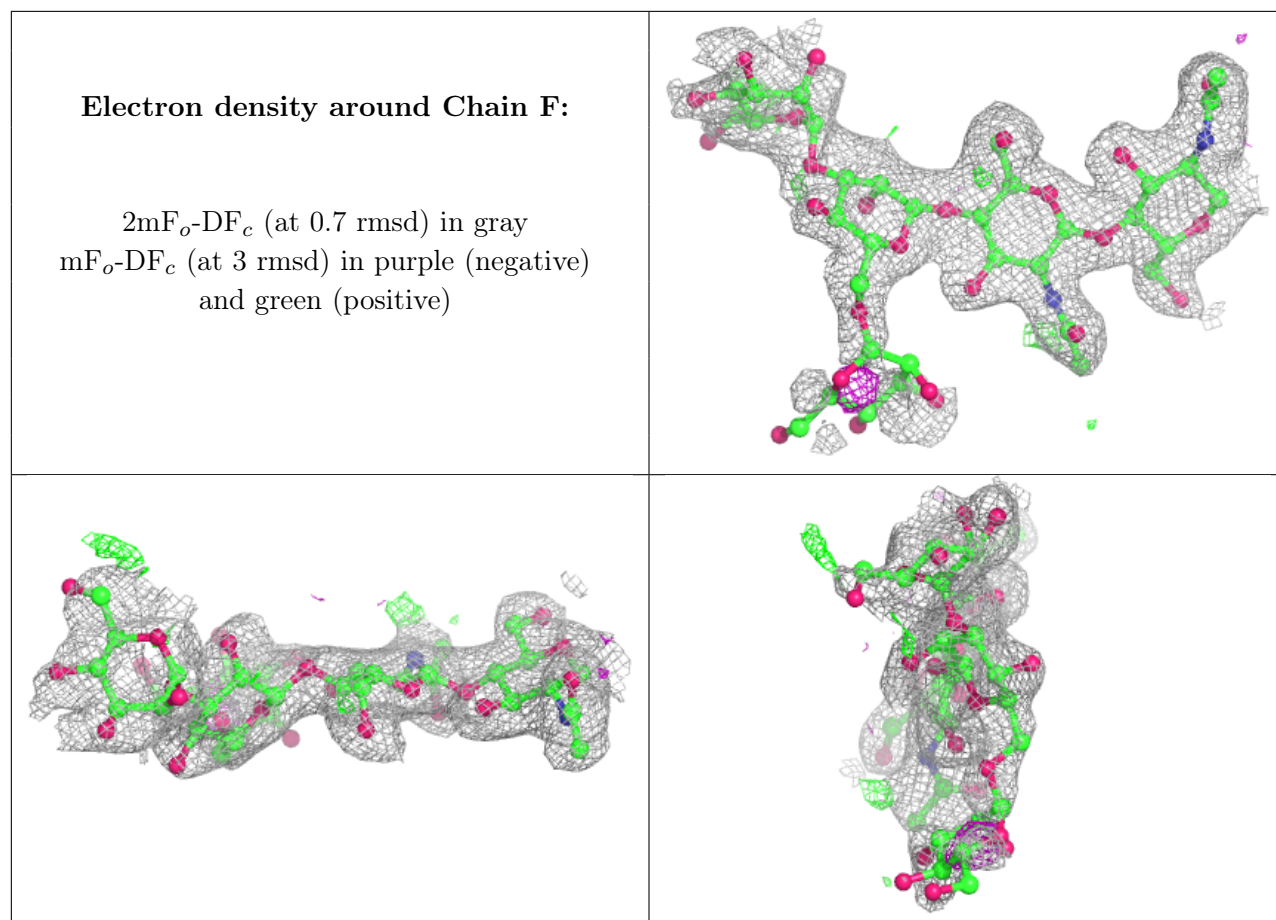
$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)

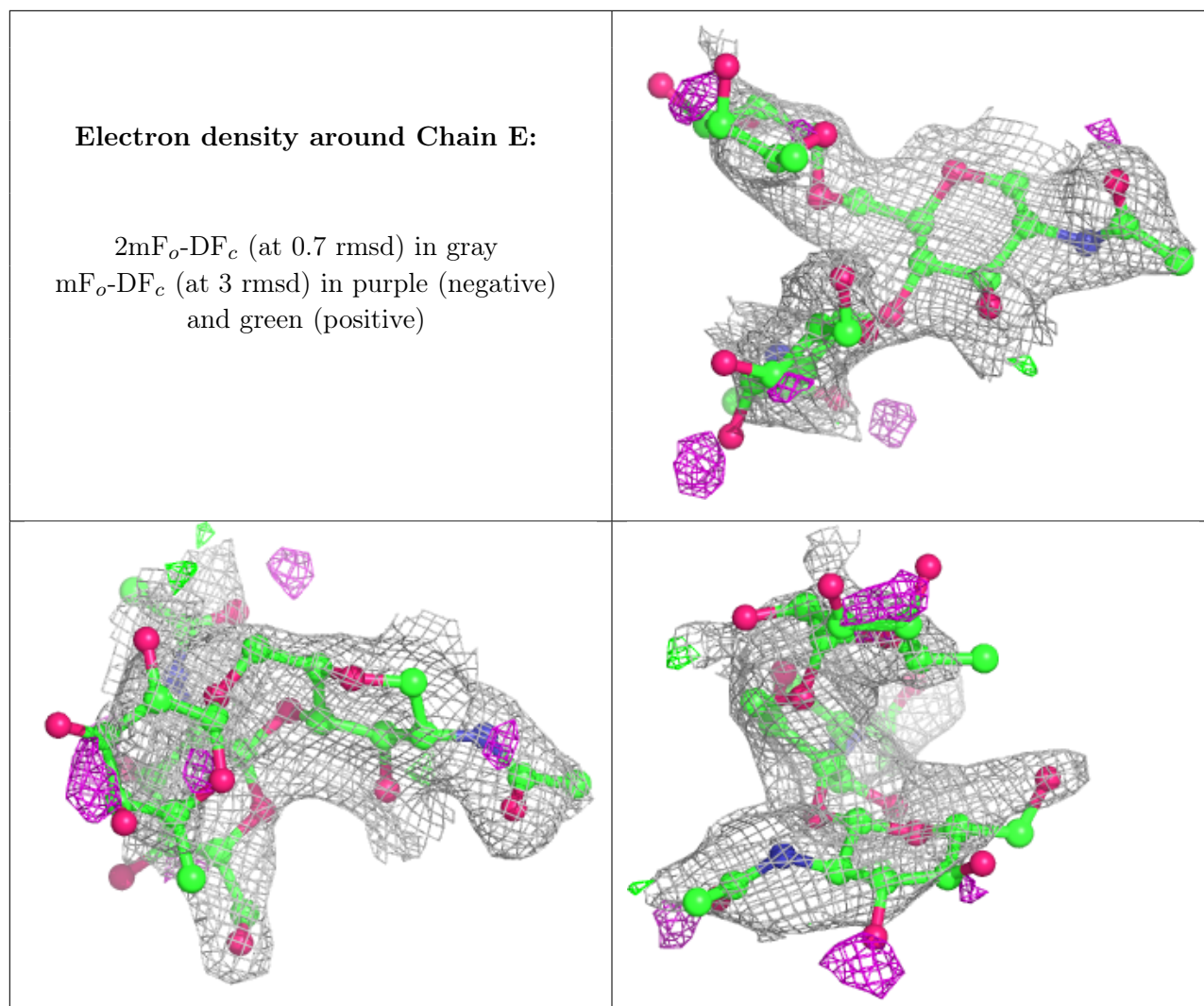


Electron density around Chain D:

$2mF_o-DF_c$ (at 0.7 rmsd) in gray
 mF_o-DF_c (at 3 rmsd) in purple (negative)
and green (positive)







6.4 Ligands [i](#)

In the following table, the Atoms column lists the number of modelled atoms in the group and the number defined in the chemical component dictionary. The B-factors column lists the minimum, median, 95th percentile and maximum values of B factors of atoms in the group. The column labelled 'Q< 0.9' lists the number of atoms with occupancy less than 0.9.

Mol	Type	Chain	Res	Atoms	RSCC	RSR	B-factors(\AA^2)	Q<0.9
7	CIT	A	1100	13/13	0.62	0.28	57,61,65,66	0
6	GLA	A	1500	12/12	0.65	0.27	71,72,75,77	0
6	GLA	B	2500	12/12	0.68	0.30	70,73,75,77	0
7	CIT	B	2100	13/13	0.70	0.36	89,90,91,91	0
5	NAG	A	885	14/15	0.75	0.33	66,73,76,76	0
5	NAG	B	885	14/15	0.81	0.34	64,72,74,75	0
6	GLA	B	2000	12/12	0.95	0.12	21,23,28,28	0
6	GLA	A	1000	12/12	0.96	0.10	14,16,22,28	0

6.5 Other polymers [i](#)

There are no such residues in this entry.